

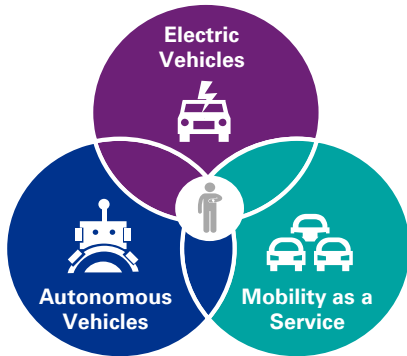


# 104<sup>th</sup> Anniversary Purdue University Road School

Driving the Future -  
Mobility in the 21<sup>st</sup> Century



# Advancements in Mobility are disrupting the transportation sector and changing the way people and goods move



The combination of AV, EV and MaaS is creating a completely **new mobility paradigm**



Autonomous vehicles will increase accessibility for the **young, old, and disabled** and will change the lifestyle of all

**+1.5 trillion**



**PMT**

**+3 trillion**



**VMT**

US expects **almost 3 trillion more vehicles miles traveled (VMT)**; in addition personal miles traveled (PMT) is expected to increase by almost 1.5 trillion by 2050



Economists predict **\$99 billion annual increase in productivity** for drivers newly freed to use their time as passengers



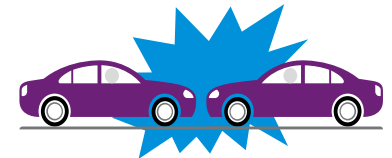
By 2030, a **new mobility services segment, worth well over \$1 trillion dollars** will emerge for products and services related to autonomy, mobility, and connectivity



Experts estimate that parking difficulties account for 30-60% of downtown traffic. **New shared economy mobility model will reduce both parking and overall vehicle congestion**



According to NHTSA data: 94% of auto accidents are caused by humans. Through global deployment of AVs, **over 1 million lives will potentially be saved annually**



Less accidents will result in **\$billions of savings in repair costs**, and hence disrupt the automobile insurance industry

With more technology driven by data the landscape becomes more complex

# Safety and security



**100  
million**

Lines of code in a new Mercedes S Class. With 300M lines in AV's

**Data Governance**

**Data Privacy**

**Data Security**

**Data Ownership**

Collecting and aggregating data through connectivity and sensors.

Encouraging shared data while still respecting the privacy of individuals

Effectively maintaining and protecting sensitive data

Driving strategic insights into actionable business advantages

**85%**

Of automakers admit their organizations have had data breaches in the past 24 months

KPMG: Your connected car is talking. Who's listening. 2016

Access to data has quickly become one of the most valued resources in the world, creating a demand for **Data & Analytics** support across the spectrum

# Government must be prepared to answer the following questions





# Aligning goals and priorities with key stakeholders is key to fostering a collaborative environment...

## Mobility Stakeholders



OEMs



Rideshare



Parking Operators



Rental cars & fleet providers



Utilities / Electrification



Public and Private transit

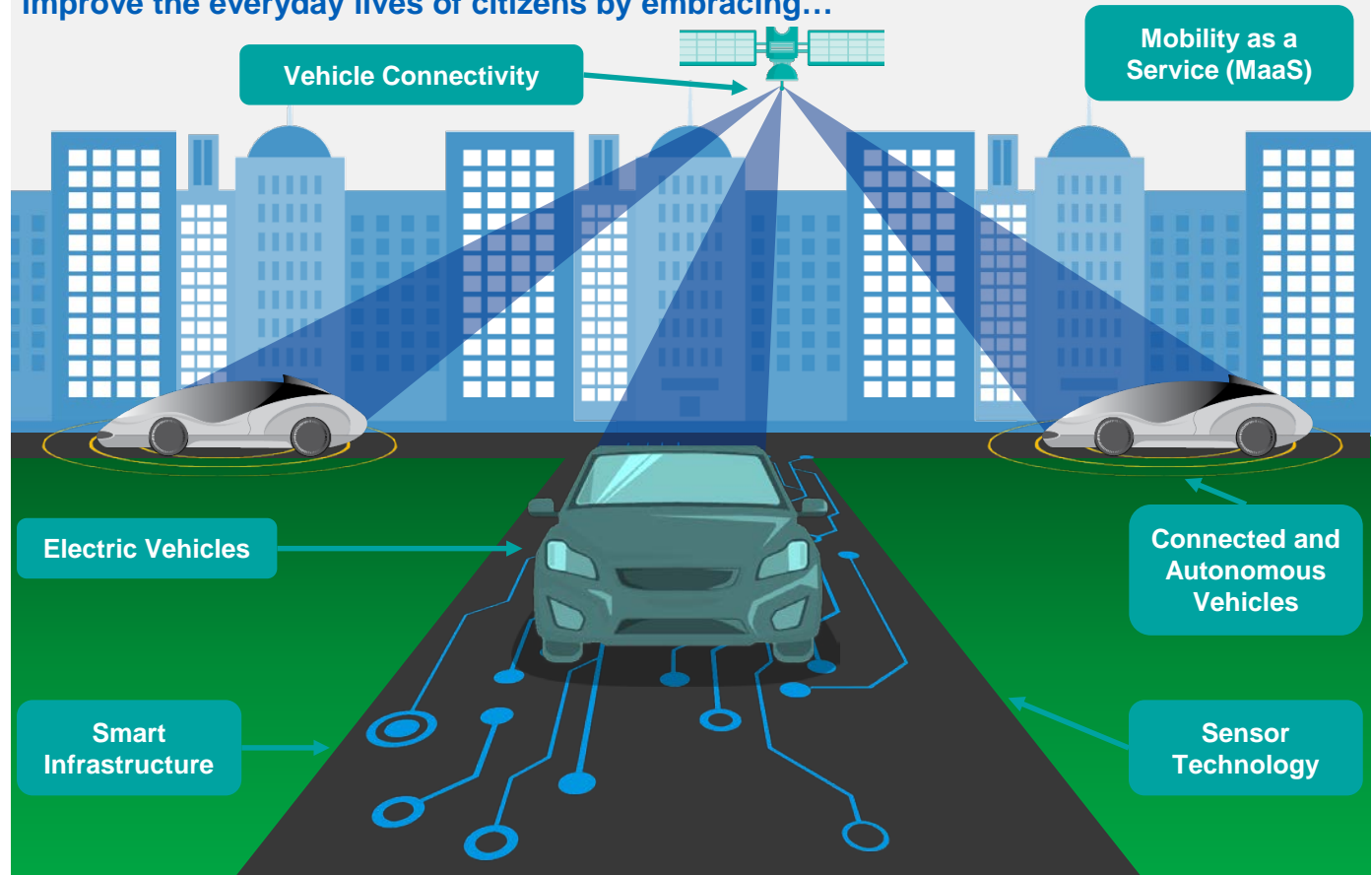


Tech providers



Citizens

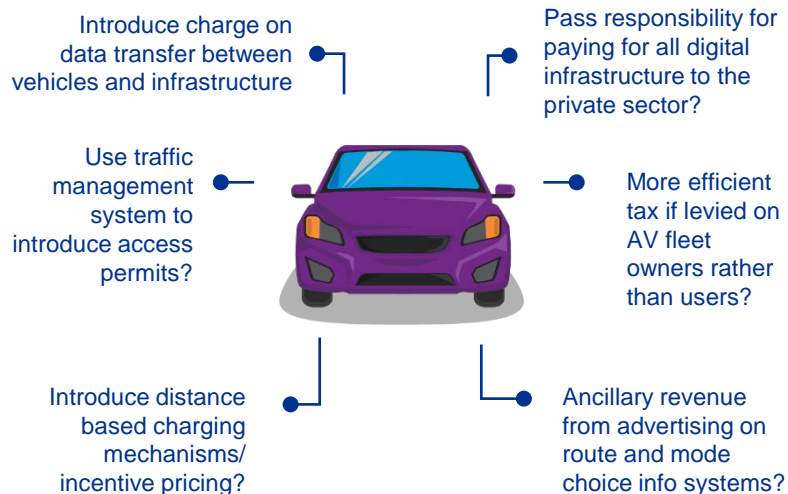
Public sector agencies will need to take a leadership position to provide mobility solutions through greater availability, reduced transportation times, and lower costs to improve the everyday lives of citizens by embracing...



... and understanding the impacts on revenue, regulations, safety and security are critical. Therefore...

### How will the public sector maintain and increase revenue?

- Need to replace declining gas tax/fuel duty revenues
- Need to fund infrastructure for AVs: traffic management systems and telematics
- Need to manage potential congestion through incentive based charging



### How will road traffic regulations change to adapt to changes in technology?



- Road traffic regulations are designed to be learned and obeyed by drivers
- In an AV world regulations become connectivity standards, operated like internet protocols
- Regulations may need to flex in real time to cope with changing conditions /congestion

### How will the safety and security of the data be managed?

- Data Ownership: How can traffic management systems access the data they need?
- Data Privacy: How to incentivize individuals whilst protecting individual data?
- Data Security: Public or private responsibility? Who sets the rules and who monitors?
- Data Value: To who? E.g. Advertising, Road condition monitoring, Passenger health

.... pulling on select levers to best enable your mobility policy goals is critical.

## Levers

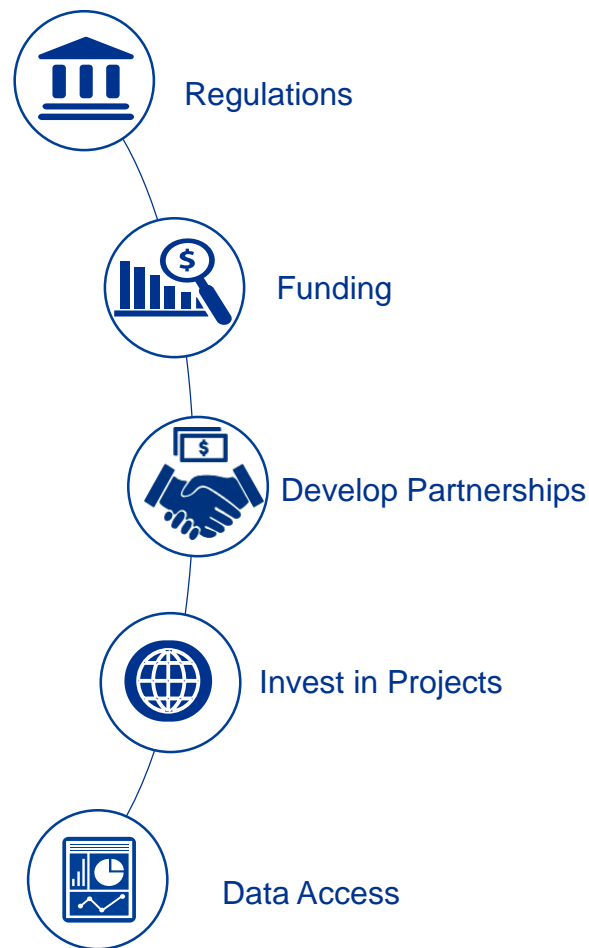
**Regulation** - Government needs to proactively embrace the autonomous vehicle movement through logical and growth oriented legislation

**Funding** - allocation of resources to develop safe and sustainable infrastructure

**Partnerships** - Investment focus is changing. Advances in mobility, connectivity, and autonomy are encouraging more dollars toward joint ventures and partnerships to bridge the gap between public and private interest

**Execute Projects** – Plan, Design, Build, and Maintain infrastructure capable of promoting a connected and autonomous environment

**Data Access**- Access to data has quickly become one of the most valued resources in the world. Government needs to effectively aggregate, analyze and protect data to drive strategic insights

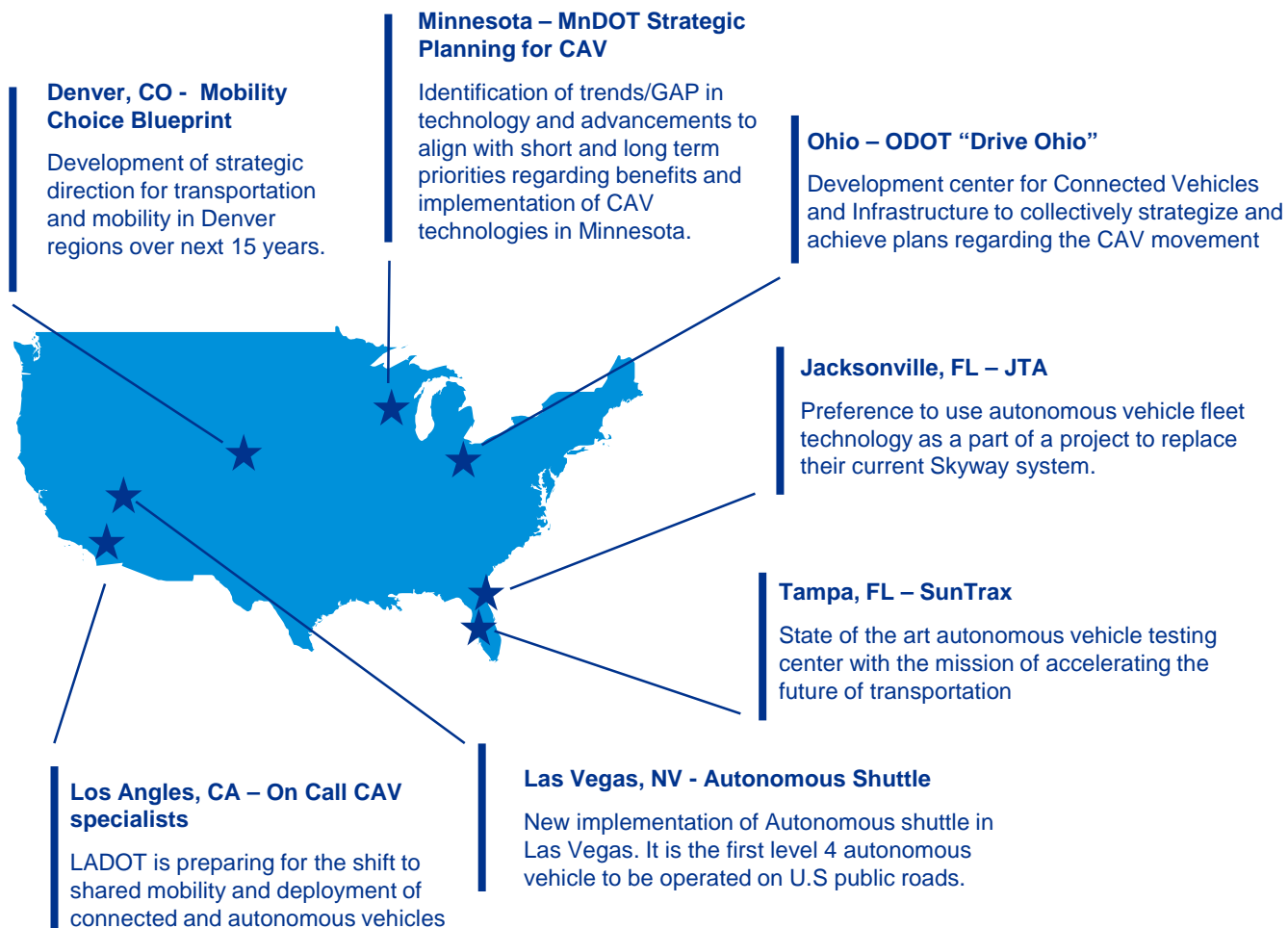


# Several states and cities are proactively launching Mobility focused initiatives

The number of states introducing legislation related to autonomous vehicles has gradually increased every year.

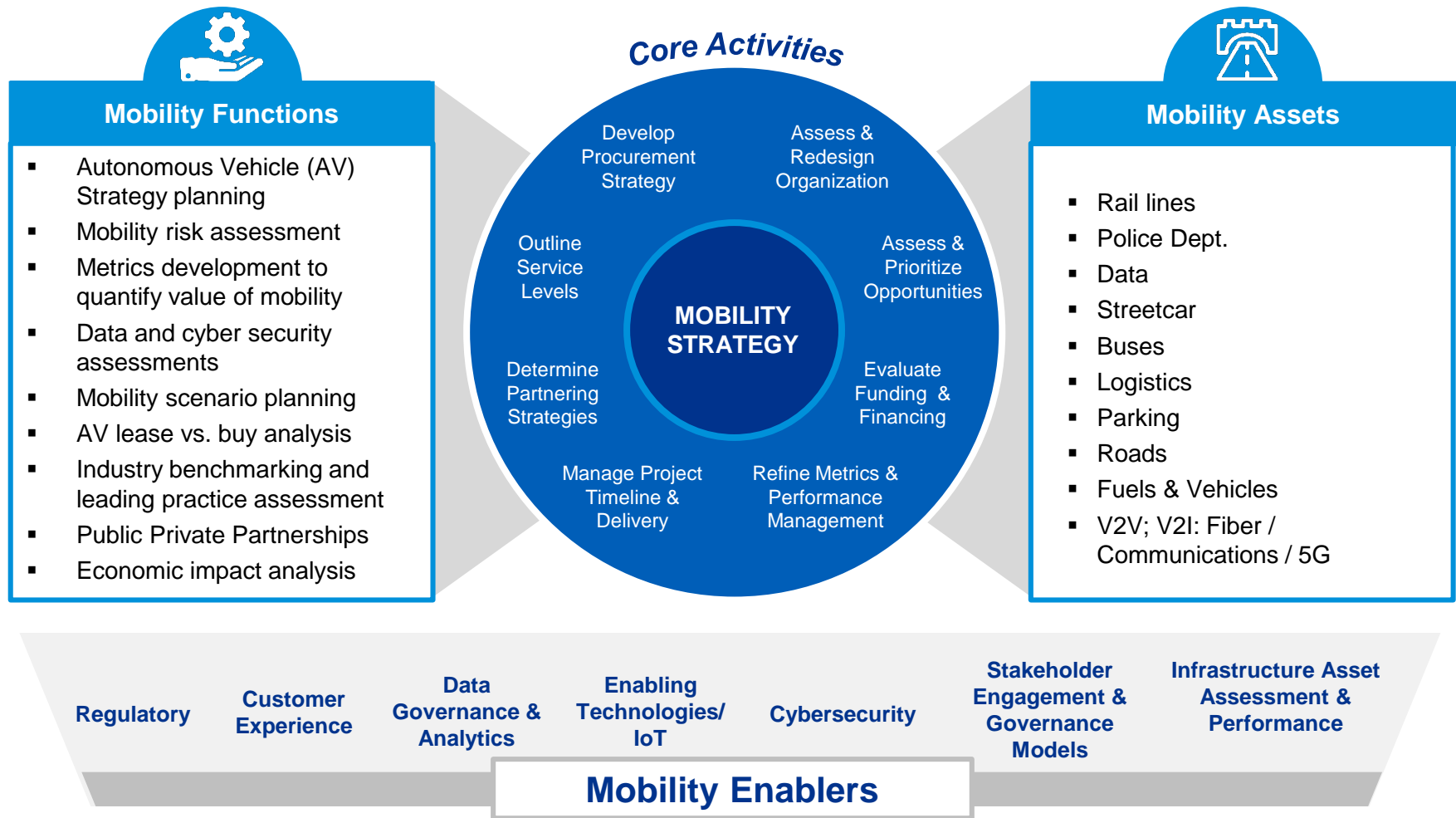
Currently, 21 states have passed legislation with 33 states introducing new legislation in 2017.

As more legislation continues to be enacted it is necessary for state agencies to develop a strategy that is dynamic to advance mobility initiatives.





# Strategy, partnering, procurement, and implementation will all be critical in the next decade



# The process to enablement...

- Policy Analysis and Development
- Objectives Definition
- Visioning and Ideation
- Goal Identification and Creation

- Predictive Data Analytics
- AV / MaaS Scenario Analysis
- Project Development Scoping
- Funding Strategy
- Data Governance
- Cyber Security
- Partnership Structuring and Development
- Market Assessments

- Partnership Implementation
- IT and Program Governance
- Funding Implementation
- Data Governance
- Cyber Security
- Asset Management
- Regulation and Policy Development



- Asset Condition Assessment
- AV / MaaS / EV Maturity Assessments
- Emerging and Enterprise Risk Assessment
- Data Risk Assessment
- Opportunity and Partnership Identification
- Funding Analysis

- AV / MaaS / EV Benchmarking
- Future Trend Analysis
- Industry Meetings (e.g., OEMs, Tier 1s)
- Stakeholder Meetings
- Revenue Strategies and Valuation
- Risk Mitigation and Enterprise Risk Management

- Metrics Development
- Incentives
- Economic Impact Analysis

# Example Efforts – Ohio Department of Transportation



## Project

### Ohio Department of Transportation – Drive Ohio

ODOT and its Center for Connected Vehicles and Infrastructure in conjunction with the Drive Ohio initiative has engaged KPMG to help develop a strategic vision and concept of operations that enables both the State and local Ohio communities to understand their collective goals for CAVs and how to effectively test and implement a strategic program.

As advisor for this project, KPMG's key objectives include:

- Conducting initial benchmarking activity of domestic and international peers that have deployed CAVs to help ODOT understand leading practices
- Lead outreach efforts to OEC and assess equipment for compatibility with operating environments and infrastructure, and outline several implementation options and scenarios
- Conduct meetings with stakeholders at the State and local level



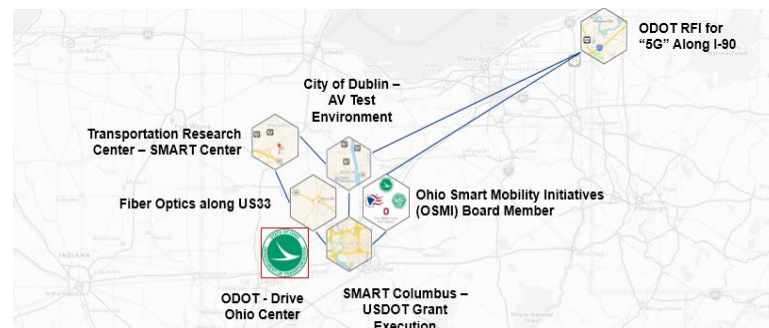
## Client Issue

ODOT's core goal is to provide efficient and safe mobility and transportation services to its citizens and visitors of Ohio. With a rapidly changing transportation ecosystem, it is crucial to adequately plan for the emergence of Autonomous Vehicles in the transportation landscape. ODOT must develop a strategy to pull the appropriate levers of **regulation, funding, partnerships, project execution, and data access** to create a effective and actionable plan.



## KPMG Resolution

- Provide full spectrum service to help ODOT develop their CAV strategy that allows for flexibility, while maintaining a focus of becoming leaders in the autonomous vehicle movement
- KPMG provided direct assistance in addressing problems such as project prioritization, analyzing approaches to communications network maturity (5G or fiber solutions), and project management



Our engagements across the mobility entities in Ohio provides a broad perspective on the strategic AV goals of the state; not just specific organizations

# Example Efforts - Jacksonville Transportation Authority



## Project

### Jacksonville Transportation Authority (JTA)

JTA has indicated a preference to use autonomous vehicle fleet technology as part of a project to replace their current Skyway system, and has engaged KPMG and PTV to help conduct a risk analysis accordingly.

As advisor for this project, KPMG's key objectives include:

- Assisting JTA assess benchmarks from other AV shuttle programs
- Helping conduct a risk analysis of the organization and AV readiness with possible mitigating approaches
- Assisting with salient business options, including how to potentially approach the implementation of autonomous fleet technologies
- Conducting risk workshops with JTA leadership and key personnel to hone in on known and potential risks with the AV program to highlight financial, infrastructure, technology and operational risks
- Scenario analysis to test operation assumptions to identify other areas of unanticipated operational risk

## Client Issue

Jacksonville is preparing for an automated future and desires a sound approach for project financing and overall mobility strategy. As the future of mobility is an emerging marketplace, JTA wants to gain a full understanding of market risk associated with implementing new technologies to ensure proper **funding, development of partnerships, and investment in projects.**

## KPMG Resolution

- Utilize KPMG's benchmark knowledge of AV programs across the U.S. and around the world to provide JTA leadership insight on the current AV landscape and best practices
- Perform a risk assessment of potential projects and develop strategies to mitigate those risks to ensure successful implementation
- Utilize KPMG's industry experience to engage both leadership and stakeholders to assess projects and implement projects in an actionable manner.



# Example Efforts – Colorado Department of Transportation



## Project

### Colorado Department of Transportation – Mobility Choice Blueprint

Mobility Choice is an initiative with the Denver Metro Chamber Leadership Foundation in partnership with the Colorado DOT, the Regional Transportation District (RTD), and the Denver Regional Council of Governments (DRCOG). They have engaged KPMG as part of a team to prepare the Mobility Choice Blueprint which is the strategic direction for transportation and mobility in the Denver regions over the next 15 years.

As advisor on this project, key objectives include:

- Set out a strategy that supports continues effectiveness in existing investments
- Establish a guideline for public investments in projects
- Align the investments of the partners to create an effective mobility system
- Include public input from throughout the region



## Client Issue

The city of Denver and Colorado DOT recognizes the need to adapt its current investments to flex with the changes in mobility over the next 15 years. With Infrastructure decisions today having a lasting impact it is crucial that the city of Denver allocates proper **funding**, develops lasting **partnerships**, and **invests** in the right projects, through informed **data** decisions.

## KPMG Resolution

- Bring KPMG's experience in transportation and mobility strategy to provide Colorado with an actionable plan to fully prepare the city of Denver for a technological shift in mobility.
- Development of public investment effectiveness plan to evaluate Denver's investments and strategy when selecting future projects.
- Coordinate the goals of the diverse stakeholders in a region through industry experience and interviews to create a unified strategy for all members.





# Example Efforts – Chicago Transit Authority



## Project

### Chicago Transit Authority (CTA) – Payment System Program Management (Ventra)

CTA engaged KPMG to assist during its transition from a legacy fare system to a new open-payment fare system, which faced technical and program management difficulties.

As advisor for this project, KPMG:

- Strategically assessed system risks to drive the development of capabilities
- Facilitated workshops with CTA and the vendor to promote the integration of the system release planning and maintenance efforts
- Developed an integrated planning function to streamline system governance process resulting improved communication between CTA and the vendor
- Provided transition management support throughout the implementation of the new system and retirement of the legacy system



## Client Issue

When transitioning from a legacy system to a new dynamic method of payment, management must be prepared to overcome pitfalls during the transition period. In order to be successful in its **investment**, the CTA must develop a strong working **partnership** with the vendor, and utilize collected **data** to continually improve the Ventra payment systems.

## KPMG Resolution

- Identification and mitigation of potential risks related to a complex transportation system
- Creation of a system that enables more effective communication and coordination between the client and other related parties
- Implement the new system and retire the legacy system while helping ensure the stability and reliability of the new architecture



# Example Efforts – Infrastructure Victoria (Australia)



## Project

### Infrastructure Victoria – Transport Demand Modeling

Infrastructure Victoria in Melbourne, Australia engaged KPMG to help analyze and consider the impacts of various road pricing schemes. The work focused on the social equity and distributional impacts of schemes (i.e. winners and losers), and included complex pricing regimes such as: area-based, cordon-based, distance-based and link-based charges. As advisor for this project, KPMG:

- Built and validated a new, cutting edge Melbourne Activity/Activity based Transport Model (the M-A2TM)
- Specified custom metrics to highlight equity impacts and winners and losers of different schemes
- Tested complex road pricing options using the M-A2TM and cloud based servers for computation and storage

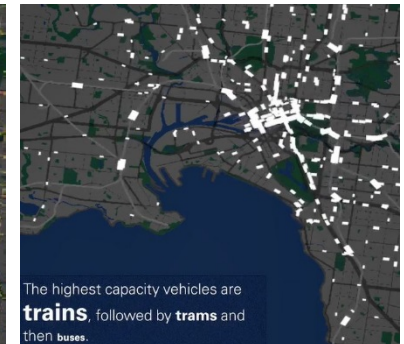
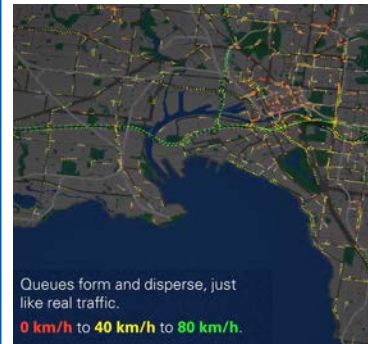
## Client Issue

In order to provide Melbourne with sustainable and efficient roads, Infrastructure Victoria is looking to analyze various road pricing schemes based upon various factors such as road usage, end destination, type of vehicle, time of day, etc. To better understand the tendencies of travelers on Melbourne roads, Infrastructure Victoria needs to aggregate and analyze **data**, which will drive **funding** decisions for **investments in projects**.

## KPMG Resolution

- Assist Infrastructure Victoria with complex modeling to optimize road pricing schemes to meet policy objectives
- Bring data analytics experience combined with an understanding of policy and political considerations
- Development of M-A2TM model to analyze time traveled, end destinations, type of vehicle traveling on network, and speed traveled

INFRASTRUCTURE  
VICTORIA



# KPMG has developed thought leadership to explore and research the rapidly changing world of mobility and the impacts to public entities

**KPMG has personnel with worldwide experience in the space that can be leveraged to address all mobility topics.**

Five areas where AVs will have significant implications for public policy and service



Predicts inner-city densification from greater take-up of on demand mobility, as AVs highlight the high cost of car ownership



Estimates the value to the UK economy of AVs at £51 billion per annum



A detailed study of the potential impacts on the insurance industry as AVs become prevalent



Explores the value and the risks associated with data-driven autonomous vehicles



Ground breaking US report from 2012 which heralded the AV revolution



2013 market research on customer willingness to embrace AVs



The era of the two car family is in decline with the rise of mobility on demand



Predicts 4 trillion more vehicle miles travelled by 2050 in the US alone, as a result of the AV revolution



How deep learning is creating the brain of autonomous vehicles and will allow them to cope with the unpredictable





# Thank you

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